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Descriptions of Two New Gastropods of the Trichotropidae from Kerguelen and Crozet Islands (South Indian Ocean)

by

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Abstract. Two new species of prosobranchs, *Torellia* ***lanata*** and *T.* (*Neoconcha*) ***angulifera***, are described from Kerguelen and Crozet islands. The two species are compared to all previously described Antarctic trichotropids and to some similar species from other areas. *Neoconcha vestita* Smith, 1907, is transferred to *Torellia* and given a new name, *T.* (*N.*) ***smithi***, because of homonymy with *T. vestita* Jeffreys, 1867. The larval development in some species of *Torellia* is discussed.

INTRODUCTION

The family Trichotropidae Gray, 1850, is today represented by several common species in Arctic and Antarctic areas, both in deep and shallow waters. In tropical areas, however, the family is rare and restricted to depths below 100–200 m with two rare exceptions: *Separatista helicoides* (Gmelin, 1791), which lives associated with a polychaete (Habe, 1962:76), and *Lippistes cornea* (Gmelin, 1791), of which the biology is unknown. As far as is known, trichotropid species are ciliary feeders (Yonge, 1962; Graham, 1954) and hermaphrodites. They have a well developed pseudoproboscis that is actually a drawn-out lower lip. Other good characters for recognizing the family are: an operculum with strongly corroded apical or lateral nucleus, usually a hairy periostracum, and distinct sculpture of close set, sharp riblets, smaller than the spiral ribs. A wide umbilicus is usually present and most genera have a well developed siphonal canal, which, however, is poorly developed or absent in *Torellia* and a few other groups.

The two species described below were found in connection with work on the Antarctic molluscan fauna by two of us (P.M.A. and J.R.C.) and revisory work on the family Trichotropidae by the third one (A.W.).

SYSTEMATICS

Family Trichotropidae Gray, 1850

Genus *Torellia* Jeffreys, 1867

Type species: *Torellia vestita* Jeffreys, 1867, by monotypy.

Diagnosis: Trichotropidae with a low-spired shell of 2–4 evenly rounded teleoconch whorls of evenly increasing diameter. Siphonal canal poorly developed or absent. Peri-

ostracum well developed, sometimes more solid than the shell, usually hairy.

Torellia ***lanata*** Warén, Arnaud & Cantera

(Figures 1, 2, 13, 21–24)

Neoconcha sp. 1: Cantera & Arnaud, 1985:57.

Material (for station data, cf. Cantera & Arnaud, 1985):

—Ker (1964): Ch.1: 1 specimen.
—Cruise MD.03 (1974): CB.7: 2 specimens (and 1 empty shell); CB.50: 1; CP.58: (2); CP.59: 11, including holotype; CB.61: 2; CB.62: 3; CP.72: 1 (1).
—Cruise MD.04 (1975): DC.8: (1); CP.13: 4; DC.37: 1; CB.60: 1; CP.61: 2; CP.92: 2; CP.182: (1); CP.226: 2; CP.285: (1).
—Cruise MD.30 (1982): CP.64: 1; DC.202: (1).

Deposition: Holotype (from MD.03-CP.59) and paratypes in Museum National d'Histoire Naturelle, Paris (no catalogue numbers assigned); paratypes in British Museum (Natural History), London (BMNH 1985163), and U.S. National Museum, Washington (USNM 859004).

Type locality: The holotype is from "Marion-Dufresne" cruise MD.03; CP.59, 43°59.2'S, 70°01.9'E, 158 m, 16 April 1974, SE of Kerguelen Is.

Distribution: Collected live between 165 and 465 m at Crozet Is. (NW of Ile des Pingouins and between Ile aux Cochons and Ile de la Possession), and between 60 and 585 m around Kerguelen Is. (mixed bottoms with calcareous sand, diatomaceous mud, basaltic gravel and boulders).

Description: Shell: Large for the family, rather fragile, inflated, white and covered by a thick, woolly, cream-colored or beige periostracum. Larval shell (Figures 21, 22) not very distinctly set off; sculptured by sharp, distinct spiral lines and less distinct, curved axial riblets; consisting of 2.5 whorls, diameter 1.6–1.8 mm. Holotype (unusually large) with 3.1 teleoconch whorls of rapidly increasing diameter. Initial part of teleoconch with about 10 narrow spiral ribs and weaker but more close-set incremental lines, together giving this part of shell a reticulated appearance. Periostracum later thickens, partly concealing the less sharp sculpture here. Initial part of teleoconch evenly rounded, later cross sections of whorls more polygonal: two keels between sutures, two keels infraperipherally, one sharp (80°) periumbilical keel forming lower corner of aperture. Keels emphasized by triangular periostracal tufts. Suture deep, channeled, partly filled by periostracum that may also cover lower part of preceding whorl. Thin parietal callus and straight columella formed by inner lip. Umbilicus broad and deep, more so in adults. Periostracum of numerous, high incremental lamellae of an opaque core and a thicker mucus-resembling outer layer (almost invisible when dry) gives the shell a thick and woolly appearance when wet contrasting with the thin, fragile-appearing shell when dry (Figures 1, 2).

Dimensions: Height of the shell 21.5 mm, diameter 22.3 mm; height of the aperture 14.2 mm, breadth 12.5 mm (holotype).

Soft parts: Tentacles short, stout, of the same length as the breadth of the snout, eyes on basal bulges of the outer sides. Penis simple, finger-shaped, flattened, curved backwards. Pseudoproboscis large, kept in a large cavity between head and foot. Hermaphrodite. Foot small. Operculum semicircular, with the curved side facing the columella and a lateral nucleus that is corroded away in adult specimens. Radula, see Figure 13.

Remarks: *Torellia* ***lanata*** resembles *T. insignis* Smith, 1915, and *T. planispira* Smith, 1915, in having strong periostracal keels. It differs, however, from the first-mentioned by having a distinct angle in the lower corner of the aperture and from the latter by having a higher spire. It differs also from *T. insignis* in having a proportionally broader radula and different shape of the radular teeth (cf. figure of *T.* ***smithi***, which closely resembles *T. insignis*). Another difference is the larval shell, which in *T. insignis, T. smithi,* and *T. planispira* consists of 1.3 spirally striated whorls of a diameter of 2.0–2.2 mm. *Torellia antarctica* (Thiele, 1912) (Figures 4, 5), which was based on a very young specimen with only slightly more than one postlarval whorl, differs by having strong spiral ridges on this first whorl and a larval shell of a diameter of 1.5 mm consisting of 1.5 whorl. Thiele (1912:plate 15, figure 21) figured the radula of *T. antarctica.* This figure looks rather different compared with Figures 11–14, but as mentioned before, his single specimen was very young and a corresponding change in radular morphology with age is discussed below (Discussion, Systematic Position).

Torellia (*Neoconcha*) ***angulifera***
Warén, Arnaud & Cantera

(Figures 3, 8, 14–16, 23, 24)

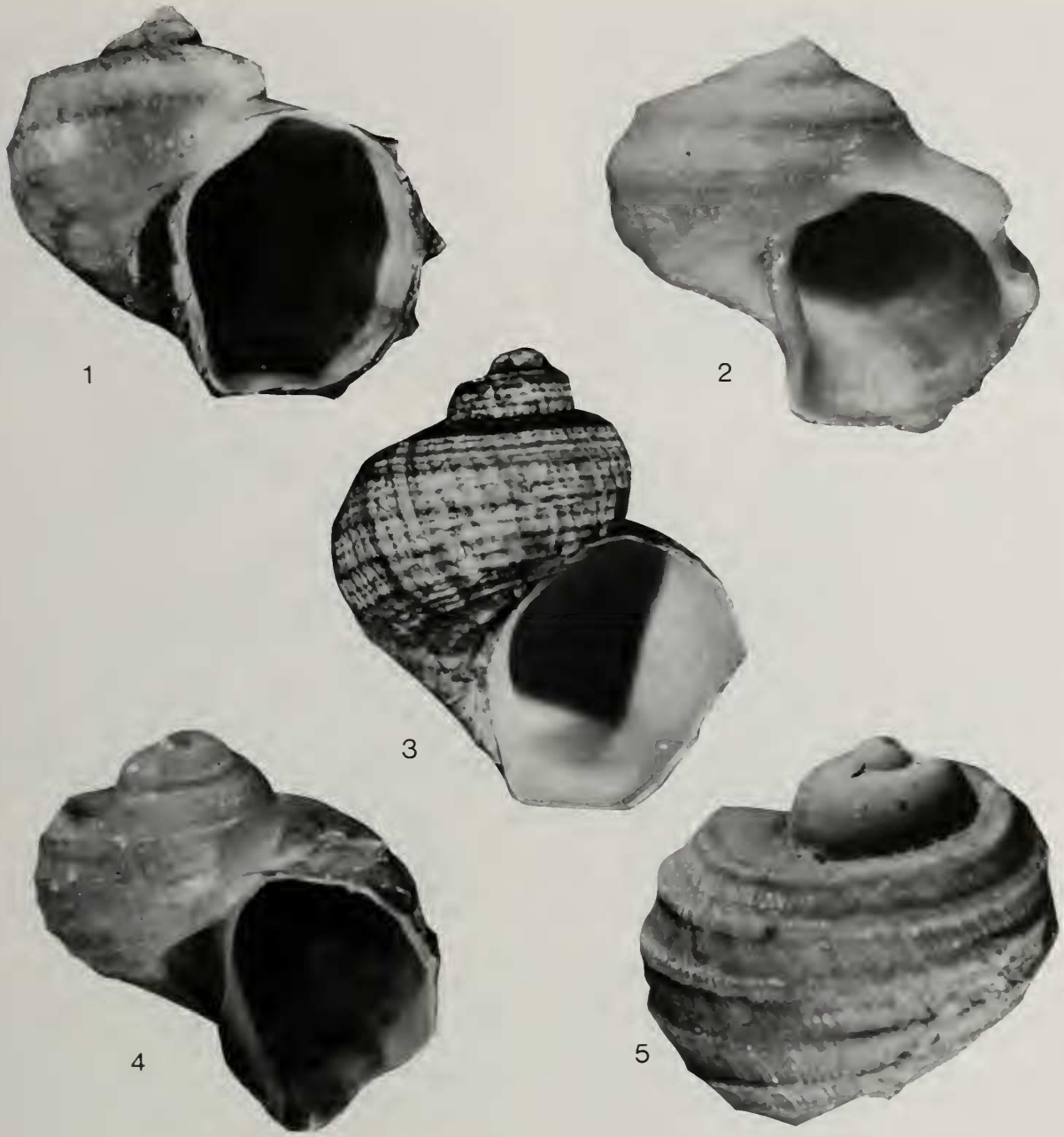
Antitrichotropis antarctica, non Thiele, 1912: Cantera & Arnaud, 1985:56.

Material (for station data, cf. Cantera & Arnaud, 1985):

—Cruise MD.04 (1975): BB.9: (1 empty shell); DC.218: 1 (holotype); BB.219–220: (1).
—Cruise MD.30 (1982): DC.24: 2 (5); CP.28: (1); DC.60: 1 (4); DC.205: (6); DC.229: (2); DC.258: (3).

Deposition: Holotype (from MD.04-DC.218) and paratypes in Museum National d'Histoire Naturelle, Paris (no catalogue numbers assigned); paratypes in British Museum (Natural History), London (BMNH 1985164), and U.S. National Museum, Washington (USNM 859005).

Type locality: The holotype is from "Marion-Dufresne"



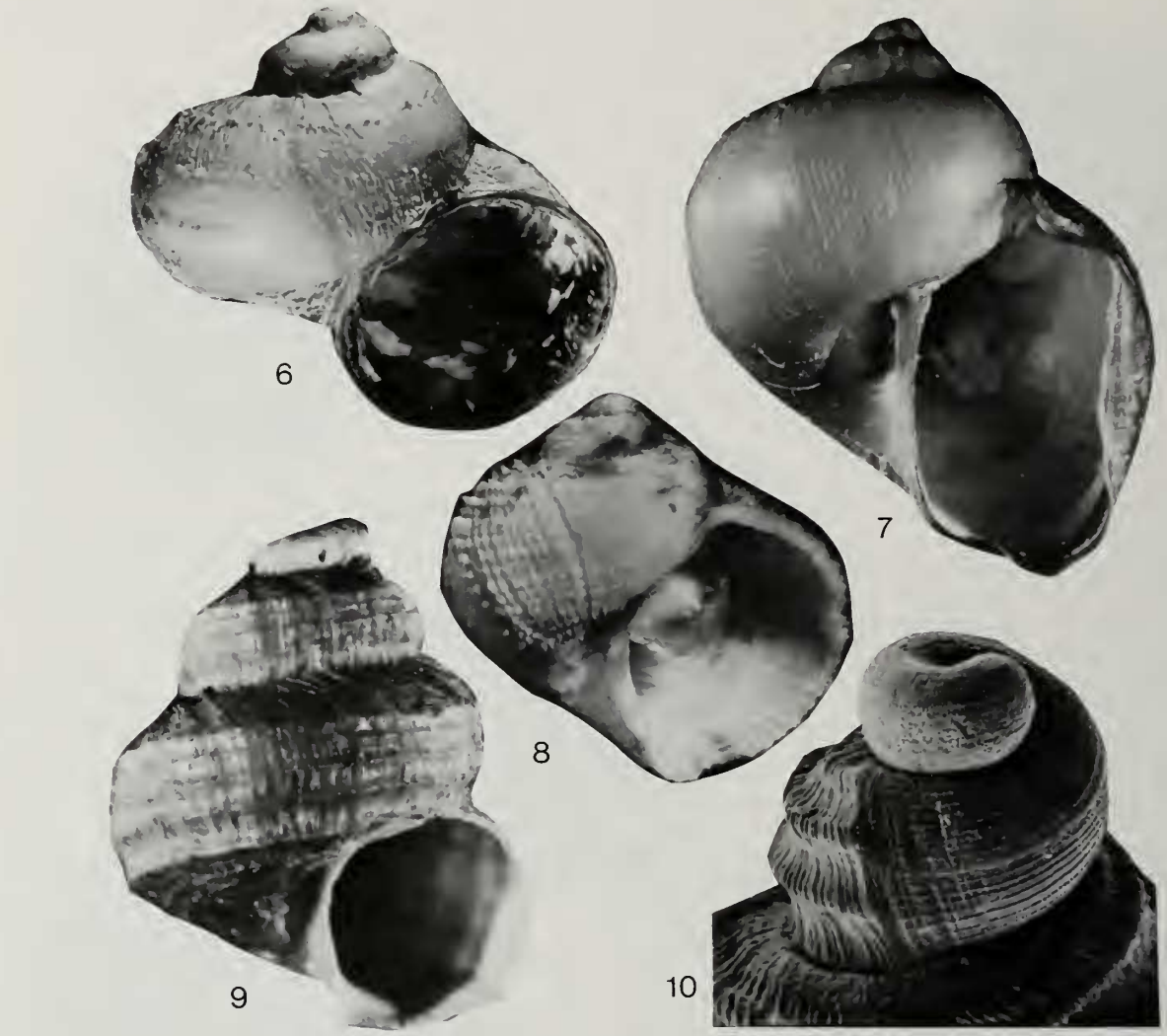
Explanation of Figures 1 to 5

Figure 1. *Torellia* (*Torellia*) ***lanata***, spec. nov., MD.03-CP.59, SE Kerguelen Islands. Diameter 18.2 mm.

Figure 2. *Torellia* (*T.*) ***lanata***, wet specimen, MD.03-CP.59. Diameter 21 mm.

Figure 3. *Torellia* (*Neoconcha*) ***angulifera***, spec. nov., MD.04-DC.218, NNE Kerguelen Islands. Height 10.6 mm, holotype.

Figures 4 and 5. *Torellia* (*N.*) *antarctica* (Thiele, 1912), syntypes, Zoologisches Museum der Humboldt Universität, Berlin, registration number 63023. Diameters 2.7 and 2.3 mm, respectively.



Explanation of Figures 6 to 10

Figure 6. *Torellia* (*Neoconcha*) *insignis* Smith, 1915, Terre Adélie, Antarctica, SE of Curie Island, 110–130 m. Diameter 21.9 mm.

Figure 7. *Torellia* (*N.*) ***smithi***, nom. nov., Terre Adélie, Antarctica, between Cap Bernard and Curie Island, 139–140 m. Diameter 14 mm.

Figure 8. *Torellia* (*N.*) ***angulifera***, MD.30-DC.24, Crozet Islands, wet specimen showing periostracum. Diameter 7.3 mm.

Figure 9. *Torellia japonica* (Okutani, 1964), holotype, Tokyo University Museum, registration number RM 8824. Height 5.97 mm.

Figure 10. *Trichotropis conica* Möller, Greenland. Height of section shown 1.15 mm.

cruise MD.04-DC.218, 48°19.3'S, 70°09.0'E, NNE of Kerguelen Is., 128 m, 10 March 1975.

Distribution: Collected live between 105 and 115 m at Crozet Is. (SE of Ile des Apôtres and NW of Ile des Pingouins) and at 128 m NNE of Kerguelen Is. (on a mixed bottom of pebbles and gravel, and on mud rich in diatoms and foraminifers).

Description: Shell: Medium size for the family, white, with a thin brown periostracum, high spire and indication of siphonal canal. Larval shell (Figures 15, 16) of 2.5 whorls, diameter of 1.6 mm, sculptured by evenly arched indistinct axial ribs and less distinct spiral lines. Whorls evenly rounded, covered by periostracum and demarcated from the teleoconch only by a change in sculpture. Holotype with 2.5–3 (apex corroded) postlarval whorls

Explanation of Figures 11 to 14

Figure 11. *Torellia* (*Torellia*) *vestita* Jeffreys, 1867, radula, Bay of Biscay.

Figure 12. *Torellia* (*Neoconcha*) ***smithi***, radula, from specimen in Figure 7.

Figure 13. *Torellia* (*T.*) ***lanata***, radula, from holotype.

Figure 14. *Torellia* (*N.*) ***angulifera***, radula, from a paratype.

Scale lines = 0.1 mm.

sculptured by about 7 (on the first one) to 16 (just above the outer lip) spiral cords of varied strength and much more close-set, oblique, sharp growth lines. Whorls usually evenly rounded, sometimes with a shoulderlike subsutural area demarcated by an angulation along part of spire. Aperture rounded with distinct siphonal corner and solid columella. Parietal callus thin.

Dimensions: Height of the shell 10.6 mm, diameter 9.6 mm; height of the aperture 6.8 mm, breadth 5.9 mm.

Soft parts: Similar to those of *Torellia* ***lanata***; pseudoproboscis and its cavity somewhat smaller. Operculum with more apical nucleus. Radula, see Figure 14.

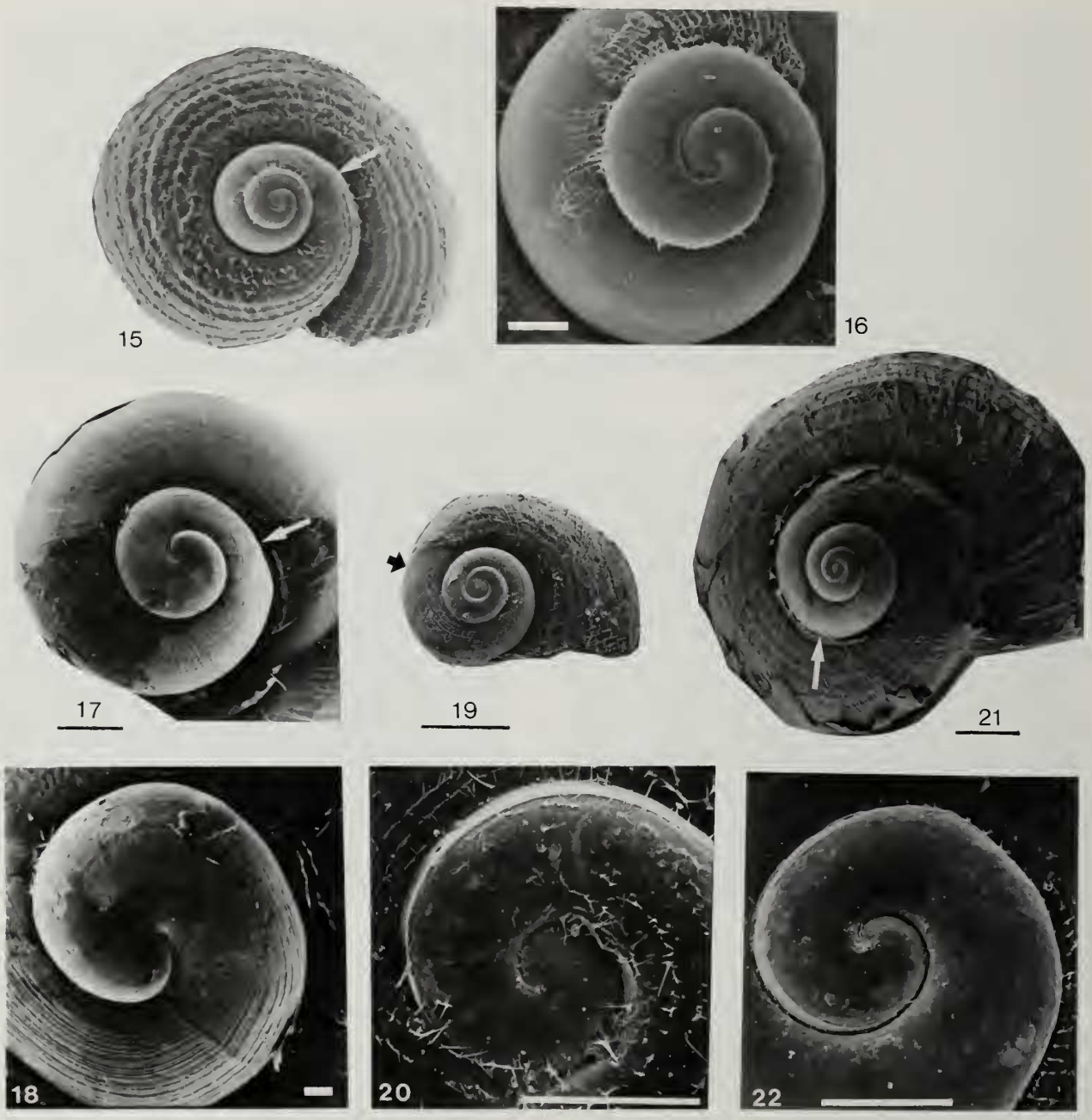
Remarks: The only trichotropid known to us that bears any resemblance to *Torellia* ***angulifera*** is *Haloceras japonicus* Okutani, 1964 (Figure 9), from deep water, NE of Miyake-Jima (Honshu, Japan). However, the type species of *Haloceras* Dall, 1889, is not a trichotropid (A.W., unpublished). From shell characters we believe that *H. japonicus* can be included in *Torellia* and that it is related to *T.* ***angulifera***. Our new species differs, however, in having a proportionally higher aperture and no keel delimiting the basal area. *Torellia japonica* also has a much smaller apical angle.

Torellia antarctica differs in having a larval shell of only 1.5 whorl and by having stronger spiral keels on the first teleoconch whorl (cf. Figures 4, 5).

DISCUSSION

Systematic Position

About 40 generic names have been proposed in, or transferred to, the Trichotropidae. Most of these names are based on species belonging to the family, and separation of genera is difficult. About six species have been



Explanation of Figures 15 to 22

Figures 15 and 16. *Torellia* (*Neoconcha*) ***angulifera***, MD.03-CP.59, Kerguelen Islands.

Figures 17 and 18. *Torellia* (*N.*) ***smithi***, apex of specimen in Figure 7.

Figures 19 and 20. *Torellia vestita* Jeffreys, 1867, Bay of Biscay.

Figures 21 and 22. *Torellia* (*Torellia*) ***lanata***, MD.03-CP.59, Kerguelen Islands.

Figures with odd numbers show the apical whorls at approximately the same magnification. Even-numbered figures are more magnified to show initial whorls. Scale lines: odd numbers = 0.25 mm, even numbers = 0.10 mm.

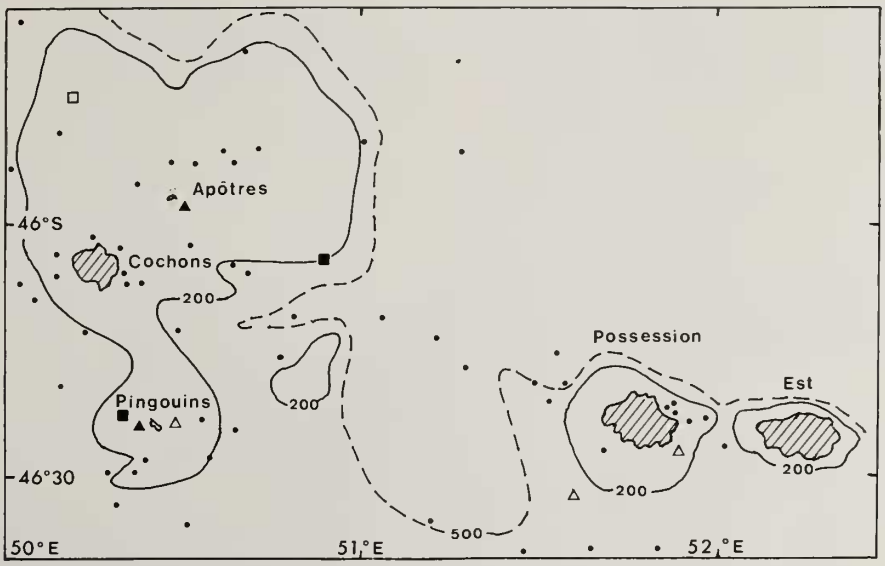


Figure 23

Distribution of *Torellia* ***lanata*** (triangles) and *T.* ***angulifera*** (squares) around Crozet Islands. Open triangles and squares indicate empty shells only. Black dots indicate negative evidence for both species.

described anatomically in some detail (Eales, 1923; Graham, 1954; Yonge, 1962; Dell & Ponder, 1964), but gaps in the knowledge of other groups make it difficult to use this information. Examination of radulae of about 20 species scattered throughout the family gave no direct indication that radular characteristics can be used to any great extent.

The only direct connection between variation in different shell characters is that a reduction of height of the spire also leads to a reduction of the development of the siphonal canal. This can be seen in the *Torellia* species discussed here, in *Lippistes* Montfort, in *Zelippistes* Suter, and in the closely related Capulidae.

Low-spired species with a poorly developed or no siphonal canal have usually been incorporated in the genus *Torellia* Jeffreys, 1867, with the exception of some Antarctic species for which the following genera have been suggested:

Trichoconcha Smith, 1907. Type species: *T. mirabilis* Smith, 1907 (by monotypy).

Neoconcha Smith, 1907. Type species: *N. vestita* Smith, 1907 C.O.D.).

Antitrichotropis Powell, 1951. Type species: *Trichotropis antarctica* Thiele, 1912 (*not* Melvill & Standen, 1912) (O.D.).

Discotrichoconcha Powell, 1951. Type species: *D. cornea* Powell, 1951 (O.D.).

Trichoconcha was separated from "*Trichotropis* and *Velutina*" by Smith (1907) because of unspecified differences in the shell but was not compared with *Torellia*. Eales (1923) remarked that it is very similar to *Torellia* and it was considered a subgenus of *Torellia* by Thiele (1929). One remarkable feature of *Trichoconcha mirabilis* noted by Eales (1923) is that is has a green radula. However, the radula of *Torellia vestita* Jeffreys, 1867, the type species of *Torellia,* is also green. We are not aware of this coloration in any other trichotropid. Similarity in both the configuration and color of these radulae, as pointed out by Eales (1923), prompts us to consider *Trichoconcha* a synonym of *Torellia*.

Neoconcha was erected without comparison with other trichotropid genera. It was maintained as a distinct genus by Thiele (1929) because of radular differences from *Torellia* (cf. Figures 11, 12). It is true that the radulae of the type species of the two genera are different and that the same type of radula as in *Torellia vestita* occurs also in *Torellia* ***angulifera*** (Figure 14) and *Neoconcha insignis* Smith, 1907. However, *Trichotropis planispira* Smith, 1915, has a radula intermediate between *Torellia* and *Neoconcha,* and because of this and similarities in shell characters, we cannot do more than keep *Neoconcha* as a subgenus of *Torellia*. This in turn will necessitate a name change of *N. vestita* Smith, because of secondary homonymy with *Torellia vestita* Jeffreys, 1867, and we suggest *Torellia* (*Neoconcha*) ***smithi***, nom. nov., to replace it.

Antitrichotropis was suggested by Powell (1951) because of "being depressed turbinate" and lacking denticles on the lateral teeth. Thiele (1929) had placed the type species, *Trichotropis antarctica,* in *Trichotropis* because of

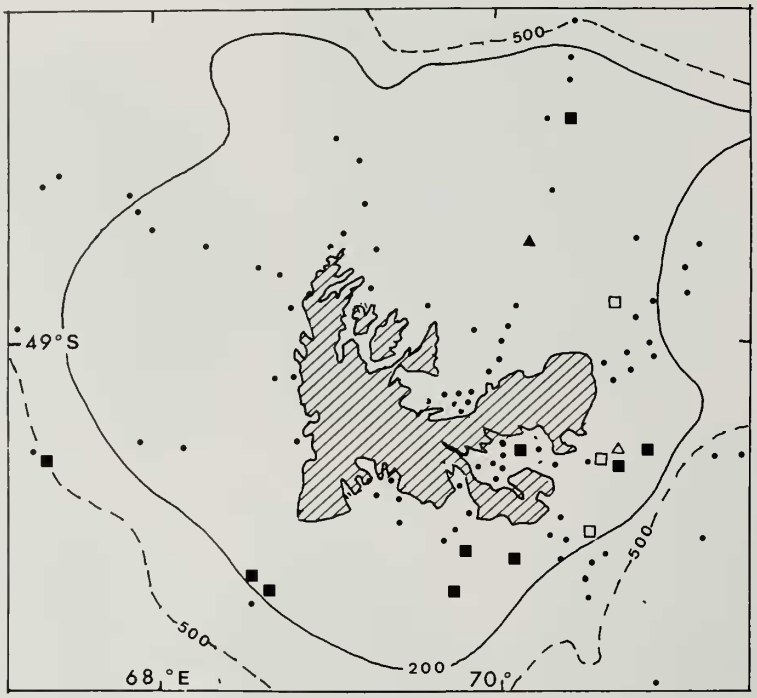


Figure 24

Distribution of *Torellia* ***lanata*** and *T.* ***angulifera*** around Kerguelen Islands. For explanation, see Figure 23.

similarities in the radula, *e.g.,* denticles on the central tooth. However, young specimens of *Torellia,* of a size comparable with the holotype of *Trichotropis antarctica,* also have central teeth with denticles; here, it is a juvenile character that disappears with age (A.W., unpublished). The radula of adult *Trichotropis antarctica* is not known, but similarites in the shell with *Torellia* ***angulifera*** and in radular morphology with *T. vestita* indicate that it will prove to belong to *Torellia,* probably to the subgenus *Neoconcha.*

The monotypic genus *Discotrichoconcha* was erected by Powell (1951) because of the flat shell and small size of the type species. So far, no living specimen has been found and the soft parts are unknown. It is, therefore, difficult to contradict Powell's statement that the differences mentioned necessitate this genus. The only possibility is to compare the variation of shell characters known in *Torellia.* In addition to the species discussed here, *Torellia* contains: *Torellia ammonia* Dall, 1919, *Torellia orientalis* (Schepman, 1909), *Torellia pacifica* Okutani, 1980, and *Torellia vallonia* Dall, 1919. *Torellia millestriata* Okutani, 1964, is omitted from this comparison because it seems to be related to *Haloceras* Dall, judging from our examination of the type specimen, but no soft parts are known.

Comparison shows that the spire of *Discotrichoconcha* is actually more depressed than in other species of *Torellia* and the aperture is distinctly broader than high. The larval shell, however, is of the same type as in other species of *Torellia*—low, rounded, and with a fine spiral sculpture—and different from that of other trichotropid genera. Therefore, we consider *Discotrichoconcha* a subgenus of *Torellia,* but examination of soft parts will probably show it to be a synonym.

Two additional Antarctic species should be mentioned here. *Lippistes exilis* Powell, 1958, has been examined. Powell's holotype is an old worn shell with no trace left of periostracum, but in the same report Powell (1958) also recorded a specimen of *Trichoconcha planispira* that we have examined. This specimen turned out to be conspecific with *L. exilis,* but had a strongly axially wrinkled periostracum, with a single periostracum keel just above the periphery. The two specimens were collected off Enderby and McRobertson islands, about 60°E. They do not belong to *Lippistes* (which has a strongly sculptured, flat larval shell with a distinct labial varix), but fit well in *Torellia,* at least from shell characters. The second species to be commented on is *Lacuna wandelensis* Lamy, 1905. It was placed in *Antitrichotropis* by Powell (1951) but belongs to the Littorinidae (Warén & Arnaud, unpublished data).

Interpretation of the Larval Shell

Thorson (1935) described the reproduction of *Trichotropis borealis* Broderip & Sowerby, 1829, and *T. conica* Möller, 1842. These species deposit egg capsules with 12–

20 eggs, which develop directly to larvae that hatch in the crawling stage. The larval shell also clearly indicates this, consisting of 1.5 whorl of a diameter somewhat less than 1 mm and clearly demarcated from the teleoconch (Figure 10). A similar, but more depressed and rounded larval shell, is also present in *Torellia mirabilis, T.* ***smithi*** (Figures 17, 18), *T. insignis, T. antarctica, T. planispira,* and *T. cornea,* and it seems obvious that these species have direct development. In the two species here described, as well as in *T. vestita,* the larval shell morphology is different. It consists of about 2.5 whorls, but the diameter is still about 1.5 mm. This size corresponds with the smallest specimens found among 150 specimens of *T. vestita* from the NE Atlantic. Therefore, one should expect planktotrophic larval development in these species. This, however, is contradicted by two facts: (1) there is no clear demarcation of protoconch 1 (Figures 15, 16, 19-22) and (2) the larval shell has a periostracum similar to that of the teleoconch. Similar conditions have been observed in the Buccinidae (Bouchet & Warén, 1985) in species in which the eggs develop to a shelled veliger larva that stays for a long time in the egg capsule, feeding on other eggs or embryos or on a rich supply of nourishment that fills out the capsule. During this time of development several additional whorls are formed; they are covered by periostracum and not distinctly demarcated from the protoconch 1. (This mode of development differs from the classical case of adelphophagy, where the initial part of the larval shell is formed very late.) Whether the species of *Torellia* with a multispiral larval shell have planktotrophic larvae or direct development as described above can presently not be inferred.

ACKNOWLEDGMENTS

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